Military base security system using Arduino

Varun Suthar	*Darshan Panwar*	*Varnitha V.*
300999varun@gmail.com	darshpanwar23@gmail.com	varnithav19@gmail.com
REVA University, Bengaluru, Karnataka	*REVA University, Bengaluru, Karnataka*	*REVA University, Bengaluru, Karnataka*

Varshitha N.
varshithasoumyaamrutha22@gmail.com
REVA University, Bengaluru, Karnataka

Nataraj Urs H. D.
natarajurs.hd@reva.edu.in
REVA University, Bengaluru, Karnataka

ABSTRACT

The primary purpose of our assignment is to offer security to armed force base. The point of convergence is about the PIR sensor, ultrasonic sensor, and unmanned wanderer. The PIR sensors which perceives the general movement of individuals in the unapproved region are set on the limit dividers of the base. After the recognizable proof of the human/object activity, the accompanying stage is to find the zone approached by the individual using the ULTRASONIC sensor based radar system which will tell the point of separation of the individual's way to deal with the base and a short time later make a move over them by using the unmanned wanderer which will follow the individual and give a live criticism through a video and the wanderer will be furnished with a missile launcher to help safeguard the base in extraordinary case .

Keywords— Military base security, PIR, Ultrasonic, Radar, Unmanned Vehicle, IoT application

1. INTRODUCTION

Our essential spotlight on this endeavour is that simply like the occupants of our country, we should empower our military capacity to refresh the advancement used for confirmation of the base and the people in the base. As a rule, one of the primary explanations behind security is to ensure our home and our family. Security framework shields the individuals from our family from thieves and interlopers and keeps us spare. By introducing different security frameworks, we will have an alleviation that we are ensured. It is an equipment framework that forestalls unapproved interruption into a reason and reports such endeavours. It is actually a strategy by which something is made sure about through an arrangement of interworking parts and gadgets.

PIR sensor distinguishes an individual moving around inside generally 10m from the sensor. PIR is commonly made of a pyroelectric sensor, which can recognize levels of infrared radiation. For different fundamental endeavour's or things that

need to discover when an individual has left or entered the zone. PIR sensors are marvellous, they are level control and insignificant effort, have a wide point of convergence run, and are anything but difficult to interface with. Most PIR sensors have a 3-pin relationship along the edge or base. The PIR goes about as a mechanized yield so you ought to just tune in for the pin to flip high or low. The development can be perceived by checking for a high sign on a single I/O pin. At the point when the sensor warms up the yield will remain low until there is development, at which time the yield will swing high for a few seconds, by then bring low back. The PIR sensor needs a warm-up time with a specific extreme goal to confine fittingly. This is a consequence of the settling time associated with thinking about nature's zone.

Ultrasonic distinguishing is maybe the best ways to deal with identify closeness and perceive levels with high reliability. An ultrasonic sensor is an instrument that measures the partition to an article using ultrasonic sound waves. High-repeat sound waves reflect from cut-off points to make undeniable resonation plans. Ultrasonic sensors work by passing on a sound wave at a repeat over the extent of human hearing. The sensor chooses the partition to a target by assessing time sneak's past between the sending and getting of the ultrasonic heartbeat. The working standard of this module is essential. It sends an ultrasonic heartbeat out at 40kHz which experiences the air and if there is a deterrent or article, it will skirt back to the sensor. By finding out the development time and the speed of sound, the partition can be resolved.

An unmanned ground vehicle (UGV) is a vehicle that works while in contact with the ground and without a locally accessible human proximity. UGVs can be used for certain applications where it may be severely planned, hazardous, or hard to have a human director present. Generally, the vehicle will have a great deal of sensors to watch the earth, and will either autonomously choose decisions about its lead or pass the information to a human overseer at another zone who will control the vehicle

through teleoperation. The UGV is the land-based accomplice to unmanned aeronautical vehicles and unmanned lowered vehicles. Unmanned mechanical self-governance is when in doubt viably made for both standard residents and military use to play out an arrangement of dull, untidy, and perilous activities. Given its application, unmanned ground vehicles will, generally, fuse the going with portions: stage, sensors, control structures, bearing interface, correspondence associations, and systems mix features. A remote-worked UGV is a vehicle that is obliged by a human manager utilizing an interface. All exercises are directed by the executive subject to either coordinate visual discernment or remote usage of sensors, for instance, electronic camcorders. A basic reason for the principles of remote movement would be a remote-controlled toy vehicle.

2. LITERATURE SURVEY

The essential job of the military is to give security to each resident and it neglects to ensure the residents in the event that it can't secure itself. Subsequently, first the army installation ought to be tied down enough to secure itself and afterward the residents.

At this moment, the PIR based security system which saves the power use and the memory space of the narrative structure has been proposed. Idle Infrared Radiation (PIR) sensor distinguishes the modification in infrared radiation of warm-blooded moving things in its disclosure run. According to the alteration in infrared radiation, there will be a modification in the voltages delivered which was upgraded and used to turn ON the webcam and lighting structure through hand-off. Writing computer programs was made and acquainted in the PC with catch and record the video when the webcam gets turned ON. Exactly when an intruder comes in the ID extent of the PIR sensor, it enacts the lighting structure and the webcam. The item recognizes the webcam affiliation; it will start to record and extra the video. At the point when the intruder moves out of the acknowledgment extent of the sensor, the webcam and light get turn OFF. The item repeats the technique. As such, the extras power use and the memory space of the bookkeeping system as the light and webcam will perhaps get turned ON when PIR sensors separate a thing. Along these lines, the system starts recording exactly when the webcam is turned ON thusly, saving memory space [1].

A non-straight Bayesian backslide engine for mechanical after subject to an ultrasonic/RF sensor unit is presented at this moment. The proposed system can keep up a proficient after of the primary human in indoor/outside settings with moderate instrumentation. Appeared differently in relation to notable camera-based restriction system the sonar group/RF based structure has the advantage of being cruel toward establishment light force changes, a fundamental concern in outside circumstances. Instead of single-plane laser expand pioneer based after the proposed contrive can all the more probable acclimate to little scene assortments, while at the same time being an in a general sense logically moderate suggestion for following a computerized unit. We present exploratory eventual outcomes of inside and outside after by mounting the sensor unit on a Garden Utility Transportation System (GUTS) robot and difference the proposed approach and direct triangulation which obviously show the inducing engine limit, to summarize, relative restriction of human and a checked improvement in following accuracy and force [6]. Human-after robots have been investigated and developed viably these decades in view of its bounteous applications in regular day to day existence and collecting. A human-after robot requires a couple of procedures,

for instance, a human's goal area, robot control figuring, and obstructions avoiding. Various philosophies of following robots have been proposed, for instance, using ultrasonic sensors, voice affirmation sensors, laser run sensors, charge-coupled contraptions (CCD) cameras, and so forth. These advances perceive the relative circumstance between a convenient robot and a human. At this moment, present another approach in perceiving the situation of an adaptable robot using an infrared camera which is the principal procedure in human after robot. In our examination, a Wii camera, which gets four social occasions of IR-LEDs presented on the robot, is joined on a human. A clear application realized persistently using a PI controller gives a couple of focal points in the proposed procedure [5].

Army installation security is consistently of principal significance, to make sure about check focuses, and guarantee troops and tasks are protected and secure. As army installations shift in size, the requirement for outside parameter security and interruption recognition can change. Army installations, regardless of whether impermanent or changeless require additional assurance and watchfulness. Foe invasion or fear monger assault are only a portion of the dangers a military security framework must distinguish sufficiently early to ensure resources, and troops.

3. PROBLEM DEFINITION

As per the current conditions of the military base, a lot of manpower is required for the security of the base itself. We have addressed this issue by helping them with a sensor-based detection and tracking of the unauthorized person and keeping unmanned wanderer for proceeding towards the current location of the person to defence the future attack.

4. METHODOLOGY

PIR sensors hardware is set on the limits of the army installation base. At the point when unapproved individual comes towards this limit, they will be identified by the PIR sensor circuit and the sign is sent to the control room where the notice will of that some movement is recognized at the limit. As the PIR identifies some movement the subsequent stage is to begin the ultrasonic sensor-based radar framework which will give us the distance and angle of the individual continuing toward the base. When the individual is distinguished the wanderer will be sent towards the area to resist the individual. The camera set on the wanderer will give the live video to the control room and continue following the individual naturally. The control room will make further move whenever required by deploying the missile launcher to the followed individual. After the undertaking is finished the vehicle will came back to its base station. Every step is actualized utilizing IoT concept.
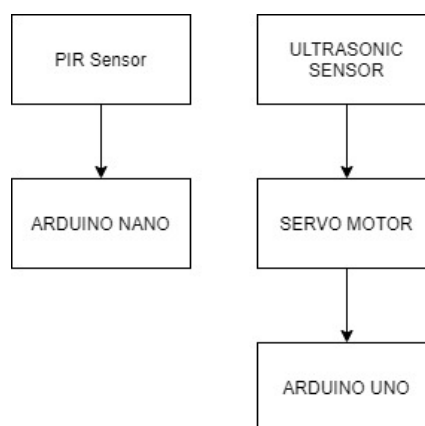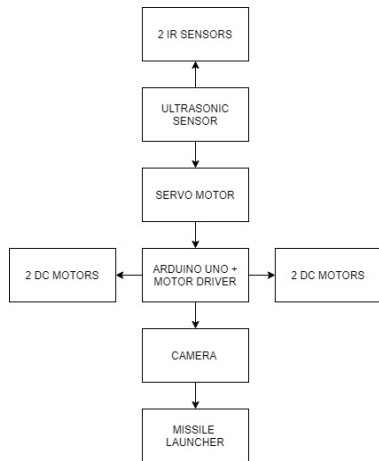

Fig. 1: PIR and Ultrasonic Block Diagram
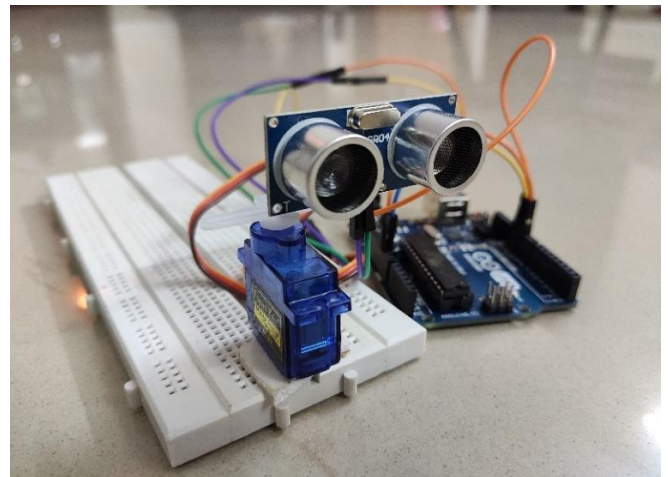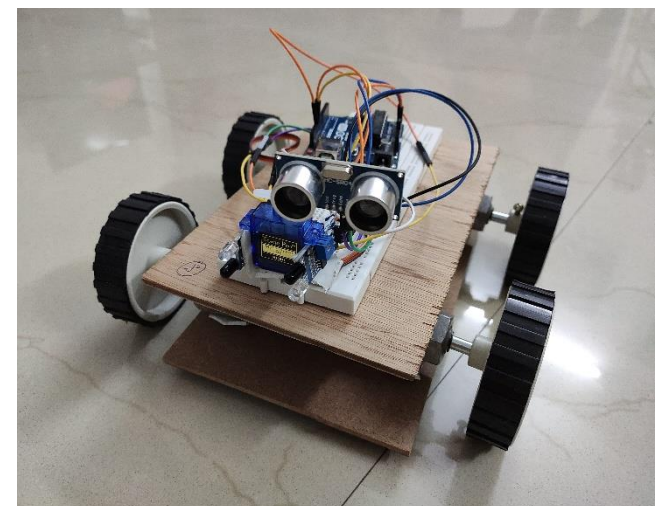
Fig. 2: Wanderer Block Diagram

5. IMPLEMENTATION

5.1 Algorithm
(a) Detection of unauthorized person
- PIR sensor will detect the human activity.
- A notification will be sent to control room.
(b) Tracking the movement of the person
- Ultrasonic sensor will track the person.
- Radar system will show the angle and distance.
(c) Defense through Wanderer
- Camera will send live footage.
- Wanderer will follow & track the attacker.
- Missile launcher will take further action.
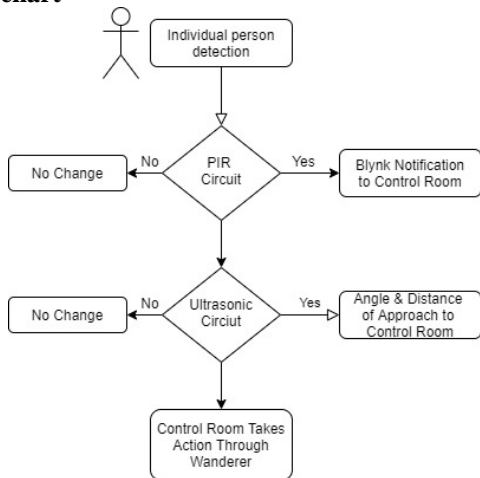
5.2 Flowchart
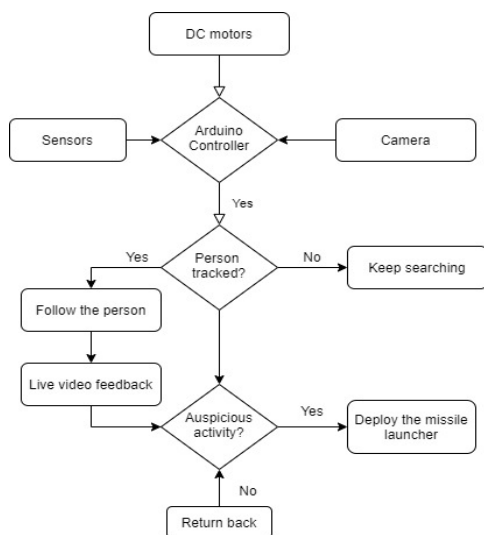

Fig. 3: PIR and Ultrasonic Sensor

Fig. 4: Unmanned Wanderer

5.3 Proposed Module

Fig. 5: Ultrasonic Sensor Module
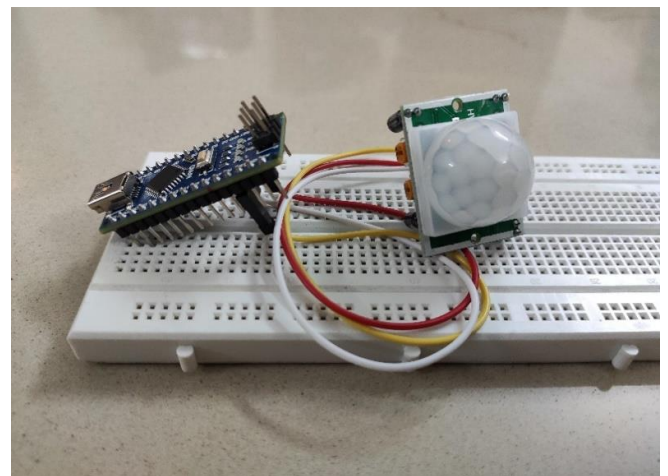
Fig. 6: PIR Sensor Module

Fig. 7: Wanderer Module

6. RESULTS AND DISCUSSION
We have done the complete implementation as discussed in the methodology for the PIR & ULTRASONIC based detection (Step 1 and 2 of the project) of unauthorized person using PIR based notifying the control room and tracking of the unauthorized person using ULTRASONIC sensor Radar system. By using the Ultrasonic sensor, we were able to detect the angle and distance of the individual approaching the base. We were able to get the perfect output till now for both the sensor circuits. The wanderer is able to follow an individual and as it is still under construction, we have not uploaded the final picture of the wanderer but we are sure that it will be able to give out live video

of the individual to the control room. As the wanderer will be equipped with missile launcher (still under construction), the control room head will be able to launch missile through IoT implementation (step 3). Hence by this complete implementation we will be able to provide proper security to the military base.
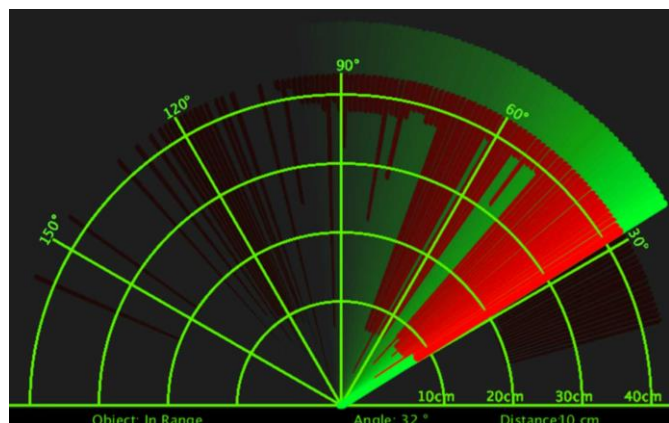

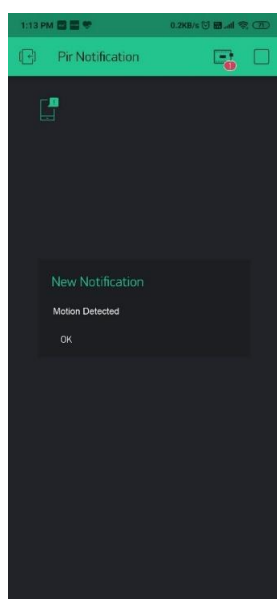**Fig. 8: Ultrasonic Sensor based Radar Output**

Fig. 9: PIR Blynk Output

7. REFERENCES

[1] Passive Infrared (PIR) Sensor Based Security System - Pema Chodon, Devi Maya Adhikari, Gopal Chandra Nepal, Rajen Biswa, Sangay Gyeltshen, Chencho - (IJEECS) International Journal of Electrical, Electronics and Computer Systems. Vol: 14 Issue: 2, June 2013

[2] Perimeter Intrusion Detective System using Arduino Article · November2019 DOI: 10.11591 -Kyi Khaing [3] Pir sensor based energy conservation and security system-January 2018 International Journal of Pure and Applied Mathematics 119(12):6591-6600.

[3] V. Jayalakshmi, S. Prakash. [4] Line Following Robot Using Arduino for Hospitals - 2019 2nd International Conference on Intelligent Communication and Computational Techniques (ICCT) Manipal University Jaipur, Sep 28-29, 2019.

[4] Human-following robot using infrared camera, January 2011, Khanh Quoc Dang, Young Soo Suh Prasad S, Mahalakshmi P, Sunder AJ, Swathi R. Smart Surveillance Monitoring System Using Raspberry PI and PIR Sensor. Int. J. Comput. Sci. Inf. Technol. 2014 Jun;5(6):7107-9.

[5] An ultrasonic/RF GP-based sensor model robotic solution for indoors/outdoors person tracking, March 20,

[6] DOI: 10.1109/ICARCV.2014.7064565,Daobilige Su, Jaime Valls Miro

[7] Prasad S, Mahalakshmi P, Sunder AJ, Swathi R. Smart Surveillance Monitoring System Using Raspberry PI and PIR Sensor. Int. J. Comput. Sci. Inf. Technol. 2014 Jun;5:7107-9.

[8] Yavuz So, Taşbaşi A, Evirgen A, Kara A. Motion Detector with PIR sensor us-age areas and advantages.

[9] Piero Zappi, Elisabetta Farella, and Luca Benini, "Tracking motion direction and distance with Pyroelectric InfraRed Sensors," IEEE Sensor Journal Class Files, 2008.

[10] L. Herbert, Berman, Altos Hills Los , and Calif, "Infrared Intrusion Detector System," 3,703,718, Nov. 21, 1972.

[11] DIVE GD. Sensing Impacts: Remote Monitoring using Sensors.

[12] Chowdhury ZI, Imtiaz MH, Azam MM, Sumi MR, Nur NS. Design and imple-mentation of pyroelectric infrared sensor based security system using microcon-troller. InStudents' Technology Symposium (TechSym), 2011 IEEE 2011 Jan 14 (pp. 1-5). IEEE

[13] Desai G. IoT approach for motion detection using raspberry PI.

[14] Nguyen HQ, Loan TT, Mao BD, Huh EN. Low cost real-time system monitoring using Raspberry Pi. InUbiquitous and Future Networks (ICUFN), 2015 Seventh International Conference on 2015 Jul 7 (pp. 857-859). IEEE.

[15] Madhuravani B, Rashmika M. Motion sensor and face recognition based sur-veillance system Using Raspberry Pi. International Journal. 2017 May 1;8(5).

[16] A. Tarun "Know about Passive Infrared Sensor (PIR) with Projects" [Online]. Available: https://www.elprocus.com/passive-infrared-pir-sensor-with-applications/[Accessed Sep 13, 2017].

[17] http://www.instructables.com/id/Raspberry-Pi-Motion-Detection-Security-Camera/ [online]. Accessed on Sept 13, 2017]

[18] Konaka, E., Suzuki, T., Okuma, S, "Line-following control of two wheeled vehicle by a symbolic control," Proc. of the 40th IEEE Conference on Decision and Control, Orlando, USA, Dec. 4 - 7, 2001.

[19] C. Cardeira, J.S. Da Costa, "A low cost mobile robot for engineering education," Industrial Electronics Society, 2005. IECON 2005. 31st Annual Conference of IEEE , 6-10 Nov. 2005

[20] Konaka, E., Suzuki, T., Okuma, S, "Line-following control of two wheeled vehicle by a symbolic control," Proc. of the 40th IEEE Conference on Decision and Control, Orlando, USA, Dec. 4 - 7, 2001.

[21] C. Cardeira, J.S. Da Costa, "A low cost mobile robot for engineering education," Industrial Electronics Society, 2005. IECON 2005. 31st Annual Conference.